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Drainage Summary Report Property of Nancy Stass 28 Old Rock Lane, New Canaan, CT

The owner proposes constructing a guest cottage at 28 Old Rock Lane in the Two Acre Residence Zone. The parcel currently is improved by a residence, detached garage, gravel driveway, and associated patios and walkways. The proposed improvements to the 2.052-acre site will result in an increase of approximately 1,839 square feet of new impervious area compared to existing conditions. This report will show that there will be no increase in runoff from new impervious surfaces and that there will not be an adverse impact on downslope properties or drainage facilities caused by this project.

Presently runoff from the site sheet flows generally from ridges along the southern and eastern property line towards the middle of the property. Runoff from the western portion of the property also flows to the approximate middle of the property. The area of the property that drains to the center is approximately 1.54 acres. The remainder of the property (approximately 0.5 acres) flows to the northern portion of the property. No work is occurring in this northern portion of the parcel, and as such we have not analyzed runoff from this area. The existing house and driveway appear to drain onto the lawn and not into a stormwater detention unit. The enclosed NRCS Web Soil Survey Report classifies the property as containing "Canton and Charlton" soils with a Hydrologic Soil Group "B" rating. Deep test pits performed by D. Palladino & Son Septic Co., Inc. reveal that this classification is appropriate for the site as the native soils are comprised of topsoil above a brown sandy loam layer that sits atop run-of-bank sand and gravel soils. These soils have a percolation rate of 1" in 10 minutes, which converts to an infiltration rate of 3 in./hr. using the Porchet Method to convert percolation test results to infiltration test results. The construction of the cottage will not alter the existing drainage flows onto or off of the site.

Using the SCS TR-20 Method, we have computed the existing and proposed runoff rates for the 1-, 2-, 5- 10-, and 25-Year, 24-Hour Storm generated by the proposed activities. The affected portion of the property has been identified as "Site South" in the enclosed hydrologic analysis. The section of the existing gravel driveway that drains to the new section of driveway by the cottage carport has been identified as "Gravel Drive" in the proposed conditions analysis. The proposed cottage and carport have been included in the "Cottage" sub-watershed. The remainder of the site, which includes the existing house, garage, driveway, and patios is included in the "Site South" sub-watershed under proposed conditions. Table I summarizes the existing and proposed runoff rates generated by the site.

Storm Event	Flow/Volume	Existing	Proposed	Δ	Δ(%)
1-Year	q (cfs)	0.58	0.55	-0.03	-5.17%
	v (CF)	2,568.00	2,456.00	-112.00	-4.36%
2-Year	q (cfs)	1.02	0.98	-0.04	-3.92%
	v (CF)	3,901.00	3,729.00	-172.00	-4.41%
5-Year	q (cfs)	1.98	1.90	-0.08	-4.04%

Table I – Summary of Runoff Rates & Volumes from Site

	v (CF)	6,725.00	6,430.00	-295.00	-4.39%
10-Year	q (cfs)	2.95	2.82	-0.13	-4.41%
	v (CF)	9,588.00	9,167.00	-421.00	-4.39%
25-Year	q (cfs)	4.67	4.47	-0.20	-4.28%
	v (CF)	14,749.00	14,102.00	-647.00	-4.39%

Runoff from the cottage will flow to two (3) Cultec Recharger 330XL units with a storage volume of 237.8 CF. Runoff from the portion of the existing gravel driveway in front of the proposed cottage will flow to a new section of gravel driveway that connects the proposed carport to the larger driveway. This new section of gravel driveway will have a two (2) foot bed of gravel beneath it that will infiltrate the runoff from this area into the well-drained soils beneath it.

The proposed Cultec units are more than enough volume to store the equivalent of the Water Quality Volume (WQV) for the site of 145.6 CF and Groundwater Recharge Volume (GRV) of 53.6 CF for all new impervious surfaces. The Cultec units will provide a Total Suspended Solids ("TSS") removal rate that exceeds 80%. Once the Cultec units are full they will discharge via a pop-up emitter. The remainder of the site will continue to allow runoff to flow along existing drainage paths.

Furthermore, this project employs "Low Impact Development" or "LID" techniques as outlined in the August 2011 addendum to the Manual entitled, "Low Impact Development Appendix to the *Connecticut Stormwater Quality Manual*". LID techniques specifically incorporated in this project include:

- Disconnection of impervious surfaces –Runoff from the cottage and new section of driveway will be detained in underground rechargers and gravel. The amount of disconnected area is greater than 100% of the proposed impervious area increase.
- Infiltration of runoff from new impervious areas
- Preservation of existing storm water travel paths
- Preservation of existing trees the vegetation along the property lines will remain and be protected during construction. All existing wooded areas will remain in their wooded condition.

All of the proposed activities will be conducted in Flood Zone "X" as delineated on the attached site plan. Please refer to the enclosed calculations and plans for further details.

With the proposed drainage structures in place, it is our professional opinion that there will be no adverse hydrological or hydraulic impacts caused to surrounding or downstream properties or drainage facilities by this development. To the best of my knowledge, this drainage proposal complies with the Town of New Canaan Planning and Zoning Regulations and Drainage Policy.



Respectfully submitted, Frangione Engineering, ALC

Robert M. Frangione, P.E. Owner & Chief Engineer November 9, 2022

Enclosures



Frangione Engineering, LLC 15 Snowberry Lane New Canaan, CT 06840 Phone: 203.554.9551 Web: www.frangione.net

Water Quality Volume Calculations Stass – 28 Old Rock Lane, New Canaan, CT November 9, 2022

Equivalent Runoff Volume Requirement Calculations:

Ex. Main House:	2,225 SF
Ex. Detached Garage:	590 SF
Ex. Gravel Drive:	7,359 SF
Ex. Patios:	789 SF
Ex. Walks:	153 SF
Ex. Pads:	30 SF
Total Ex. Impervious Area:	11,146 SF
Ex. Main House:	2,225 SF
Ex. Detached Garage:	590 SF
Pr. Gravel Drive:	7,685 SF
Pr. Cottage :	1,513 SF
Ex. Patios:	789 SF
Ex. Walks:	153 SF
Ex. Pads:	30 SF
Total Pr. Impervious Area:	12,985 SF

Impervious Area Increase (ΔA) = 12,985 – 11,146 = 1,839 SF

Water Quality Volume (WQV) Calculations:

Total Contributing Area = 0.042 ac. = 1,839 SF (Impervious Area Increase)

Impervious Area = 1,839 SF = 0.042 ac. Woods Area = 0 SF = 0.0 ac. Lawn Area = 0 SF = 0.0 ac.

I = (0.042/0.042) = 1.0	RvI = 0.95
%T = (0.0/0.042) = 0.0	RvT = 0.22
%F = (0.00/0.042) = 0.0	RvF = 0.04

R = (RvI x %I) + (RvT x %T) + (RvF x %F)= (0.95)(1.0) + (0.22)(0.0) + (0.04)(0.0) = 0.95

WQV = (1" x R x A)/12

 $= (1" \times 0.95 \times 0.042 \text{ ac.})/12 = 0.0033 \text{ ac.-ft.} = 145.6 \text{ CF}$

Proposed Detention Facility: (3) Cultec Recharger 330XL units with 12" of gravel surrounding.

 $V_s = 3$ units x 79.26 CF/unit = 237.8 CF >> WQV required => WQV storage is met.

Groundwater Recharge Volume:

 $GRV = F \times I$

F = 0.35 inches for Type "B" Soils I = 1,839 SF (Impervious Area Increase)

 $GRV = (0.35 \text{ in.})/(12 \text{ in./ft.}) \times 1,839 \text{ SF} = 53.6 \text{ CF} << V_s => GRV \text{ storage is met}$





Stass Existing

Prepared by Frangione Engineering, LLC HydroCAD® 10.20-2g s/n 11202 © 2022 HydroCAD Software Solutions LLC

Events for Subcatchment 1S: Site South

Event	Runoff	Volume
	(cfs)	(cubic-feet)
1-Year	0.58	2,568
2-Year	1.02	3,901
5-Year	1.98	6,725
10-Year	2.95	9,588
25-Year	4.67	14,749

Summary for Subcatchment 1S: Site South

Runoff = 4.67 cfs @ 12.09 hrs, Volume= 14,749 cf, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs Type III 24-hr 25-Year Rainfall=6.40"

	A	rea (sf)	CN	Descriptior	ו			
*		2,225	98	Ex. Main H	louse			
*		590	98	Ex. Detached Garage				
*		7,359	96	Gravel surf	face, HSĞ E	3 (driveway)		
*		789	98	Ex. Patios		· · ·		
*		30	98	Ex. Pads				
*		153	98	Ex. Walks				
		16,220	55	Woods, Go	ood, HSG B			
		39,597	61	61 >75% Grass cover, Good, HSG B				
		66,963	65	65 Weighted Average				
		63,176		94.34% Pe	rvious Area			
		3,787		5.66% Imp	ervious Are	a		
	Tc	Length	Slop	e Velocity	Capacity	Description		
	(min)	(feet)	(ft/ft	t) (ft/sec)	(cfs)			
	5.5	74	0.108	1 0.23		Sheet Flow,		
						Grass: Dense n= 0.240 P2= 3.50"		
	0.4	52	0.017	3 2.12		Shallow Concentrated Flow,		
						Unpaved Kv= 16.1 fps		
	5.9	126	Total,	Increased	to minimum	Tc = 6.0 min		





Events for Link 4L: Point of Concern

Event	Primary	Volume
	(cfs)	(cubic-feet)
1-Year	0.55	2,456
2-Year	0.98	3,729
5-Year	1.90	6,430
10-Year	2.82	9,167
25-Year	4.47	14,102

Summary for Subcatchment 1S: Site South

Runoff = 4.47 cfs @ 12.09 hrs, Volume= 14,102 cf, Depth> 2.64" Routed to Link 4L : Point of Concern

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs Type III 24-hr 25-Year Rainfall=6.40"

	Area (sf)	CN	Description				
*	2,225	98	Ex. Main H	ouse			
*	590	98	Ex. Detach	ed Garage			
*	6,259	96	Gravel surf	ace, HSĞ E	3 (driveway)		
*	789	98	Ex. Patios	-			
*	30	98	Ex. Pads				
*	153	98	Ex. Walks				
	16,220	55	Woods, Go	od, HSG B			
	37,758	61	61 >75% Grass cover, Good, HSG B				
	64,024	65	65 Weighted Average				
	60,237		94.09% Pe	rvious Area			
	3,787		5.91% Impe	ervious Area	а		
	,		•				
٦	c Length	Slop	e Velocity	Capacity	Description		
(mi	n) (feet)	(ft/ft	t) (ft/sec)	(cfs)	•		
5	.5 74	0.108	1 0.23		Sheet Flow.		
-					Grass: Dense n= 0.240 P2= 3.50"		
0	.4 52	0.017	3 2.12		Shallow Concentrated Flow.		
-					Unpaved Kv= 16.1 fps		
5	9 126	Total.	Increased	to minimum	1 Tc = 6.0 min		
0		. star,					

Summary for Subcatchment 2S: Cottage

Runoff = 0.22 cfs @ 12.08 hrs, Volume= 776 cf, Depth> 6.16" Routed to Pond 3P : Cultecs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs Type III 24-hr 25-Year Rainfall=6.40"

	Are	a (sf)	CN I	Description		
*		1,513	98	Pr. Cottage		
		1,513		100.00% In	npervious A	Area
	Tc L	ength	Slope	Velocity	Capacity	Description
(m	in)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
(6.0					Direct Entry,

Summary for Subcatchment 5S: Gravel Drive

Runoff = 0.20 cfs @ 12.08 hrs, Volume= Routed to Pond 6P : New Gravel 704 cf, Depth> 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs Type III 24-hr 25-Year Rainfall=6.40"

Area	ı (sf)	CN I	Description		
1	,426	96 (Gravel surfa	ace, HSG E	3
1	,426		100.00% Pe	ervious Are	ea
Tc Lo (min)	ength (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Pond 3P: Cultecs

Inflow Area	=	1,513 sf	,100.00% Impervious,	Inflow Depth > 6.1	6" for 25-Year event
Inflow	=	0.22 cfs @	12.08 hrs, Volume=	776 cf	
Outflow	=	0.03 cfs @	12.59 hrs, Volume=	776 cf, A	tten= 86%, Lag= 30.1 min
Discarded	=	0.03 cfs @	12.59 hrs, Volume=	776 cf	
Primary	=	0.00 cfs @	0.00 hrs, Volume=	0 cf	
Routed	to Link 4	4L : Point of (Concern		

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2 Peak Elev= 293.24' @ 12.59 hrs Surf.Area= 155 sf Storage= 269 cf

Plug-Flow detention time= 75.5 min calculated for 775 cf (100% of inflow) Center-of-Mass det. time= 75.1 min (818.8 - 743.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	290.50'	153 cf	6.33'W x 24.50'L x 3.54'H Field A
			550 cf Overall - 168 cf Embedded = 382 cf x 40.0% Voids
#2A	291.00'	168 cf	Cultec R-330XLHD x 3 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		320 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices			
#1	Discarded	290.50'	3.000 in/hr Exfiltration ov	er Surface	area	
			Conductivity to Groundwater Elevation = 289.00'			
#2	Primary	294.00'	4.0" Horiz. Orifice/Grate	C= 0.600	Limited to weir flow at low heads	

Discarded OutFlow Max=0.03 cfs @ 12.59 hrs HW=293.24' (Free Discharge) **1=Exfiltration** (Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=290.50' (Free Discharge) ←2=Orifice/Grate (Controls 0.00 cfs)

Summary for Pond 6P: New Gravel

Inflow Area	a =	1,426 sf,	0.00% Impervious,	Inflow Depth >	5.92" f	or 25-Year event
Inflow	=	0.20 cfs @	12.08 hrs, Volume=	704 cf		
Outflow	=	0.03 cfs @	12.54 hrs, Volume=	704 cf	, Atten=	83%, Lag= 27.6 min
Discarded	=	0.03 cfs @	12.54 hrs, Volume=	704 cf		-

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs Peak Elev= 294.53' @ 12.54 hrs Surf.Area= 326 sf Storage= 200 cf

Plug-Flow detention time= 37.7 min calculated for 704 cf (100% of inflow) Center-of-Mass det. time= 37.6 min (793.9 - 756.3)

Volume	Inve	ert Avai	il.Storag	ge Storage Descri	iption	
#1	292.9	9'	264	cf Custom Stage	Data (Prismatic)	Listed below (Recalc)
Elevatior (feet	ר)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
292.99	9	326	0.0	0	0	
293.00)	326	40.0	1	1	
294.00)	326	40.0	130	132	
294.99	9	326	40.0	129	261	
295.00)	326	100.0	3	264	
Device	Routing	In	vert C	Outlet Devices		
#1 Discarded 292.99' 3.		3.000 in/hr Exfiltrat	00 in/hr Exfiltration over Surface area nductivity to Groundwater Elevation = 290.00'			

Discarded OutFlow Max=0.03 cfs @ 12.54 hrs HW=294.53' (Free Discharge) **1=Exfiltration** (Controls 0.03 cfs)

Summary for Link 4L: Point of Concern

Inflow Are	ea =	65,537 sf,	8.09% Impervious,	Inflow Depth >	2.58"	for 25-Year event	
Inflow	=	4.47 cfs @ 1	12.09 hrs, Volume=	14,102 c	f		
Primary	=	4.47 cfs @ 1	12.09 hrs, Volume=	14,102 c	f, Atter	n= 0%, Lag= 0.0 mi	in

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs



Web Soil Survey National Cooperative Soil Survey



Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
60B	Canton and Charlton fine sandy loams, 3 to 8 percent slopes	В	3.7	100.0%
Totals for Area of Intere	st	3.7	100.0%	

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified Tie-break Rule: Higher

